Davidson Seamount: Biological Characterization and Protection

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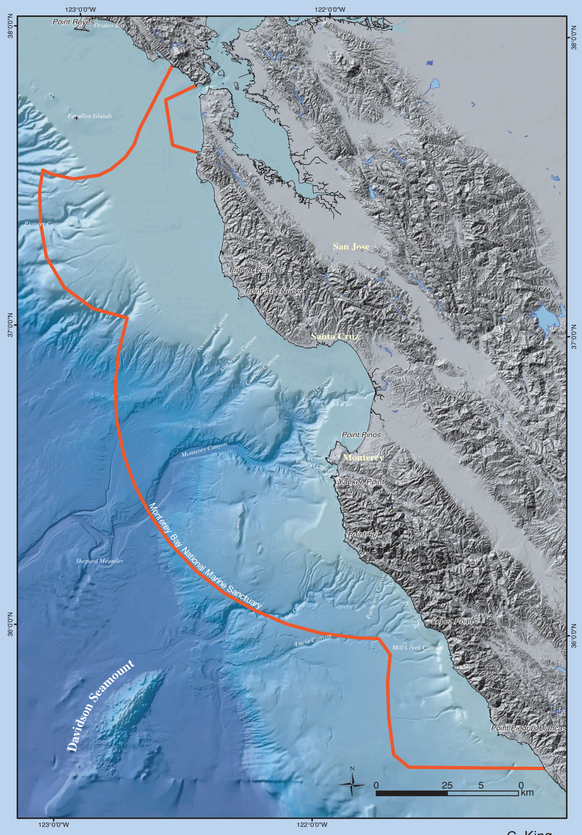


C. King

ABSTRACT

The Davidson Seamount is an impressive geologic feature located 120 km southwest of Monterey, California. This inactive volcano is roughly as tall as the Sierra Mountains (2,300m) and as wide as the Monterey Bay (40 km), yet its summit is far below the ocean surface (1,300m). It is only recently that remotely operated vehicles provide the capability to carefully characterize the organisms living on the seamount. In 2002, we obtained 90 hrs of videotape from all depths of the seamount. The crest of Davidson Seamount had the highest diversity of species, including huge corals and sponges. While detailed analyses are still in progress, it is clear that these assemblages of species are arranged in previously undiscovered large, contiguous patches, and are susceptible to physical disturbance. To conserve this pristine area, the Monterey Bay National Marine Sanctuary is currently considering inclusion of the Davidson Seamount into its protective boundary.

THE DAVIDSON SEAMOUNT IS:

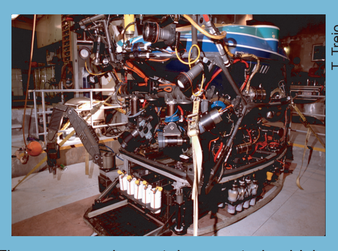
- An inactive ocean-floor volcano that last erupted about 12 million years ago
- The first geographic feature to be characterized as a “seamount”
- One of a group of submarine volcanoes (Guide, Pioneer, and Gumdrop) off the continental margin, offshore Central California
- One of the largest seamounts in U.S. waters
- Located 120 kilometers (75 statute miles) to the southwest of Monterey, due west of San Simeon, California
- 42 kilometers (26 miles) long, and 13 kilometers (8 miles) wide
- 2,300 meters (7,546 feet) tall, from the ocean floor to the highest point on the crest
- 1,300 meters (4,265 feet) below the sea surface
- Located in a cold (about 39ºF, or 4ºC), completely dark, and high pressure environment.

WAYS TO ACCESS THE SEAMOUNT

It is only with recent technology that we can effectively access the Davidson Seamount. The Monterey Bay Aquarium Research Institute (MBARI) has developed innovative remotely operated vehicle technology to record images and collect organisms from the deep sea. Airplanes can also be used to survey for offshore marine mammals.

M. Leet for MBARI (c) 1997

The *R/V Western Flyer* is MBARI’s, flagship research vessel and mother ship for the *ROV Tiburon*.



T. Trejo

The unmanned remotely operated vehicle (ROV) *Tiburon*, designed and built by MBARI, is a state-of-the-art platform for exploring the deep-sea to depths of 4,000 meters. The vehicle is equipped with cameras, lights, manipulator arms, in situ sensors, and other specialized sampling devices that allow *Tiburon* to serve as scientists’ undersea eyes, ears, and hands.

NOAA

The Shrike Aero Commander is a versatile and stable high-winged twin piston-engine aircraft that is suitable for a variety of missions; including marine animal surveys.

ORGANISMS ABOVE THE SEAMOUNT

NOAA

Black-footed Albatross (*Pheobastria nigripes*)

NOAA

Dall's porpoise (*Phocoenoides dalli)*

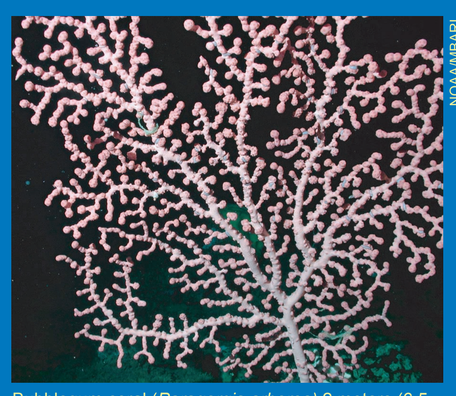
NOAA

Killer whale *(Orcinus orca)*

NOAA

Humpback whale (*Megaptera novaeangliae*)

ORGANISMS ON THE SEAMOUNT



NOAA/MBARI

Bubblegum coral (*Paragorgia arborea)* 2 meters (6.5 feet) in height were not unusual at the seamount crest (1257 meters).

NOAA/MBARI

A rare anglerfish or sea toad (B*athychaunax coloratus*), measuring 20.5 cm (8 inches) total length, was observed along the slope at 2461 meters.

NOAA/MBARI

Venus 's flytrap anemones *(Hormatiidae)* were found most often on the seamount slope, here at 1874 meters.

NOAA/MBARI

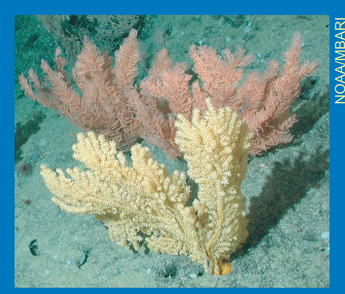
Red vermillion crab (*Paralomis verrilli*) dangling off a yellow sponge; amidst a white sponge, white gorgonian corals, and shrimp (1355 meters).

NOAA/MBARI

Basket star (*Gorgonocephalus eucnemis*) perched high atop a yellow sponge (1362 meters).

NOAA/MBARI

Halosaur (*Aldrovandia* sp) at 1736 meters.



NOAA/MBARI

Gorgonian corals at 1958 meters.

NOAA/MBARI

Octopus (*Benthoctopus* sp) and an orange stalked crinoid at 2422 meters.

FINDINGS AT THE SEAMOUNT

Biological diversity

We have yet to complete a detailed site characterization from our video survey, but preliminary observations of the habitat and species assemblage are extraordinary. The number of new species is unknown, but with the samples collected and associated digital video, there is a potential to describe several. The number of rare species is also unknown; however, there are at least 4 rare fishes and many invertebrates have yet to be identified. A preliminary analysis of the fauna, on and above the seamount, indicates a diverse assemblage of invertebrates, fishes, seabirds, and marine mammals.

- 135 Invertebrate taxa
- 23 Fish taxa
- 21 Seabird taxa
- 11 Marine Mammal taxa

Ecological patterns

Several habitats can be found on the Davidson Seamount, including apparent zonation patterns. The highest diversity can be found at the seamount crests.

Surface Habitat

The waters above the Seamount host a variety of seabirds, marine mammals, and surface fishes, including albatross, shearwaters, jaegers, sperm whales, killer whales, albacore tuna, and ocean sunfish.

Crest Habitat (~1250-1450 meters)

A diverse species assemblage can be found at the seamount crests including large gorgonian coral (Paragorgia sp) forests, vast sponge fields, crabs, deep-sea fishes, shrimp, and basket stars (Gorgonocephalus eucnemis).

Slope Habitat (~1450-2990 meters)

The slope habitat is composed of cobble and rocky areas interspersed with shallow areas of ash and sediment. This area hosts a diverse assemblage of sessile invertebrates, and rare seldom seen deep-sea fishes.

Base Habitat (~2990-3250 meters)

The interface between the deep soft bottom and rocky outcrops is a distinct habitat for mobile macrofauna. These consist of familiar looking species with relatives living in the nearshore including sea cucumbers, urchins, anemones, and sea stars.

Geology

The volcanic rocks found on Davidson Seamount are predominantly differentiated alkalic basalt, hawaiite, and mugearite. These evolved lavas are highly viscous (thick and pasty) and form short, thick flows and steep-sided knobby structures at the vents. The high viscosity of these lavas also likely inhibited the loss of gas bubbles, thereby making the eruptions more explosive. The lavas travelled to the surface quickly and carried up rare xenoliths (foreign rocks) of mantle materials as well as a range of coarsely crystallized fragments of lava slowly solidified at depth. Mysteriously, coastal rocks have also somehow been transplanted to the seamount.

PROTECTION FOR THE DAVIDSON SEAMOUNT IN THE FUTURE?

The Sanctuary is currently undergoing a management plan revision, with extensive participation by the public. One item under consideration is the inclusion of the Davidson Seamount into the Sanctuary. Habitat and species descriptions are being used to determine conservation, recreation, ecological, historical, cultural, scientific, educational, and aesthetic values of the area. Davidson Seamount has clearly captivated the imagination of many people, and the area is relatively pristine. Potential threats to the seamount include bioprospecting and other forms of physical disturbance, especially to large, ancient species. The status of this process is available on the World Wide Web at http://sanctuaries.nos.noaa.gov/jointplan/mb_davidson.html . If you would like to comment on this topic, please send an e-mail to andrew.devogelaere@noaa.gov.

National Marine Sanctuaries ™ Monterey Bay

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